

DEPARTMENT OF MINES
SOUTH AUSTRALIA

REPORT ON FOUNDATION TESTING.
PORT PIRIE HOSPITAL EXTENSION SITES

by

A.A. GIBSON - SENIOR GEOLOGIST

SUMMARY

Six power-auger test bores were put down on the sites of proposed extensions to the Port Pirie hospital. The water table was found to stand at a depth of only 2'3" below the natural surface. Whilst the sequence of clay strata passed through was substantially the same for all holes, there was wide variation in the degree of firmness of the strata from place to place. Consistently stiff clay was not encountered until an average depth of 40ft. had been reached, but in the first four holes the clay was predominantly firm below a depth of about 21 feet. Piling will be necessary and it is suggested that if the piles are driven to a depth of 40 feet, or shallower refusal, selective piling will be adequate, but for shallow piling the piles will need to be grouped to minimize a possible tendency to overtilting.

INTRODUCTION

Investigation of the foundation conditions at the sites of the proposed extensions to the Port Pirie hospital was initiated by Mr. A.J. Boyes, Structural Engineer, Architect in Chief's Department. A detailed lay-out plan was submitted with the request and in addition to the written application Mr. Boyes discussed the details verbally. The limitations of the Land Rover-mounted power-auger were pointed out to Mr. Boyes, but he

considered that the information obtained by this means would be adequate and the investigation proceeded.

Mr. Boyes visited the sites whilst boring was in progress and witnessed the performance of the auger and the manner in which information on the foundation conditions was obtained.

RELIABILITY OF RESULTS

From the accompanying logs of the boreholes it will be seen that the material encountered consisted of silty to sandy clays of various colours and degrees of firmness. It will be appreciated that in auger boring, particularly where water is present as in this case, there is often considerable lag in receiving the cuttings at the surface after they have been cut and the presence of water allows cuttings to become mixed with those from higher up. Whilst sufficient information was gained from the cuttings to allow of identification of the material encountered, it was not possible to determine accurately the depths at which changes in clay type occurred.

The changes of strata were logged as near as possible from the sludge returned to the surface and these logs were checked against the material adhering to the spiral flights when they were withdrawn. In this way approximate geological logs were compiled and it is possible that certain boundaries between clay types are in error by several feet; for instance,

the boundary between the yellowish brown to reddish-brown sandy clays and the brown silty clay.

However, the points at which changes in firmness of the clays occurred are accurate to the nearest inch or so, since these data were obtained by careful observation of the performance of the auger, particularly the resistance offered to the auger feed.

SCALE OF FIRMNESS

In the accompanying logs and on the attached sections a somewhat arbitrary scale of firmness is used to describe the physical properties of the clays. The scale ranges from "very soft to soft" where the clays offered little or no resistance to drilling, up to "stiff to very stiff" where the resistance to boring was such that the rear end of the Land Rover could be lifted up to two inches off the blocks used to stabilise it. When it is borne in mind that the spade-type cutting-bit used was only $3\frac{1}{8}$ " x $\frac{3}{4}$ ", or 2.34 square inches in bearing area, it will be realised that the "stiff to very stiff" material has a very high bearing capacity indeed. The intermediate gradings depended upon the "feel" of the degree of resistance offered to boring as trans-mitted to the feed-sheel, such "feel" being interpreted by the driller, with frequent checks by the writer.

INTERPRETATION OF RESULTS.

Water was encountered very early in all holes and it was well-nigh impossible to judge thereafter how many lower water layers were encountered. It is fairly safe to assume, however, that all of the very soft material encountered was water bearing. The unconsolidated pale-grey shelly muds encountered in AB. 4. and AB. 6. flowed copiously into the holes for a while and their presence therefore quickly detected.

Depths to water-level were measured after each hole had stood open and indurated for at least 12 hours and these measurements establish the water-table at an average depth of 2ft. below the natural surface.

Consistently firm clays were not encountered until an average depth of 40ft. was reached. However, in the first 4 holes (AB. 1 to AB. 4) the clays were predominantly firm below a depth of about 21ft. Bore AB. 1 revealed an exceptional amount of stiff material below a depth of 10ft.

In terms of depths below the previous natural surface (not below present surface), bores Ab. 5 and AB. 6 may be generalized as follows:-

From 0	to 9'	Predominantly soft.
" 9'	" 22½'	" firm
" 22½'	" 31'	" soft
" 31'	" End	" firm

CONCLUSIONS

From the point of view of determining the type of foundation required, this boring has merely confirmed Mr. Boyes' opinion that piling will be necessary. However, the boring has provided useful data for determining the probable depth to which piles will need to be driven and to decide whether selective piling or group piling will be necessary. In regard to these factors the following suggestions are submitted.:-

Proposed Kitchen and Dining Rooms:

Selective piling should be adequate. In the vicinity of AB. 1 piling is likely to meet the required resistance, or even refusal, before a depth of 27ft. is reached, but in the vicinity of AB. 2 it will probably be necessary to drive the piles to a depth of 40ft. Intermediate positions should require piles to intermediate depths, but it is thought that the conditions at AB. 1 are exceptional and it will be necessary to drive the majority of piles to a depth of 40ft.

Proposed Boiler House:

The conditions revealed by the two test borings on this site (AB.3 and AB.4) are closely comparable.

If selective piling is used here it will be necessary to drive the piles to a depth of 40ft. below the natural surface to gain adequate lateral support and penetrating resistance. If shallower piling is to be used it should be driven to a depth of at least 28' below the natural surface. It will then be

necessary to closely group the piles to avoid any tendency to over-tilting, since really firm clays are not encountered until a depth of 20ft. below the natural surface is reached and there is inadequate lateral support.

Proposed Laundry:

At this site selective piling to an average depth of 30ft. below the natural surface is suggested. Closely grouped shallow piling driven to depths not exceeding 22ft. below the natural surface could be used, but it is doubtful whether the required penetration resistance would be encountered.

Bore logs, plan and sections accompany this report.

(A.A. Gibson)
SENIOR GEOLOGIST.

AAG:AGK
10.1.57

LOG OF AUGER BOREHOLE NO. 1

6531-1297.

SITE: Port Pirie Hospital Extension
 PLANT: R.60 Land Rover - mounted power auger
 DRILLER: C.R. McMahon. DRIVER: T.D. Jennings.
 PURPOSE: Investigation of foundation conditions.
 DATE COMMENCED: 4.12.1956. DATE COMPLETED: 4.12.1956

Logged by A.A. Gibson

-33.178
 138.000

<u>Depth</u>		<u>Description</u>
<u>From</u>	<u>To.</u>	
0	0'5"	Dark grey sandy loam, merging to light brown.
0'5"	2'0"	Light greenish grey with yellow-brown mottling. Moderately soft.
2'0"	5'6"	Ditto, but very wet and sloppy.
5'6"	9'0"	Mid-grey finely sandy clay, soft and wet.
9'0"	10'0"	Ditto, but moderately firm.
10'0"	13'0"	Yellowish-brown sandy clay. Moderately firm.
13'0"	17'6"	Light reddish-brown sandy clay. Firm.
17'6"	18'6"	Yellowish-brown sandy clay. Very firm.
18'6"	19'6"	Ditto, but very soft.
19'6"	27'0"	Brown silty clay. Stiff to very stiff with some very thin soft bands.
27'0"	28'6"	Brown sandy clay. Very firm.
28'6"	28'10"	Soft brown sandy clay.
28'10"	29'6"	Brown, slightly sandy clay. Firm.
29'6"	32'0"	Soft in brown sandy clay.
32'0"	34'6"	Firm reddish-brown silty clay.
34'6"	36'6"	Red-brown and grey mottled clay. Stiff
36'6"	37'3"	Alternate firm and soft bands of reddish-brown clay
37'3"	38'6"	Red-brown and grey mottled clay - stiff.
38'6"	39'0"	Soft red-brown clay.
39'0"	40'6"	Moderately firm red-brown and grey mottled clay.
40'6"	41'6"	Two bands of very stiff red-brown and grey mottled clay with a thin soft band separating.
41'6"	42'0"	Alternate firm and soft bands of red-brown clay.
42'0"	50'0"	Very stiff red-brown and grey mottled clay with occasional thin soft bands.
50'0"	51'3"	Predominantly soft red-brown and grey mottled clay with some stiff bands.

End of Hole - Water stands at 2'3".

15.62

LOG OF AUGER BOREHOLE NO. 2.

SITE: Port Pirie Hospital Extension.
PLANT: R.60 Lan Rover - mounted power auger.
DRILLER: C.R. McMahon. DRIVER: T.D. Jennings.
PURPOSE: Investigation of foundation conditions.
DATE COMMENCED: 4.12.1956. DATE COMPLETED: 4.12.1956
Logged by A.A. Gibson

Depth

<u>From</u>	<u>To.</u>	<u>Description</u>
0"	0'5"	Slag and grey-brown sandy loam.
0'5"	1'0"	Light yellow-brown clayey sand.
1'0"	6'0"	Very moist and soft, pale greenish-grey clay, with yellow-brown mottling.
6'0"	11'0"	Mid-grey, slightly sandy to silty clay. Soft.
11'0"	11'6"	Very stiff greyish-brown clay, sandy.
11'6"	18'5"	Very soft, yellowish-brown clay. sandy.
18'5"	18'9"	Very stiff, reddish-brown slightly sandy clay.
18'9"	20'9"	Very soft, reddish-brown and yellowish sandy clay.
20'9"	23'6"	Alternate firm and soft bands of brown, finely sandy clay.
23'6"	24'6"	Very soft, brown, silty clay.
24'6"	25'9"	Very soft, brown, silty clay with a thin firm band.
25'9"	27'0"	Very firm, brown, silty clay with two thin soft bands
27'0"	28'6"	Very soft, brown, silty clay.
28'6"	29'0"	Firm. brown, silty clay.
29'0"	30'0"	Very soft, brown silty clay.
30'0"	31'6"	Very firm brown, silty clay.
31'6"	34'0"	Very soft, brown, silty clay with two thin, very firm bands.
34'0"	37'6"	Moderately stiff, brown, silty clay.
37'6"	37'10"	Soft, brown, silty clay.
37'10"	39'6"	Very firm, red-brown clay with grey mottling.
39'6"	46'9"	Very stiff, red-brown clay with grey mottling. Occasional thin bands of soft clay.

14-23

End of Hole - Water stands at 2'6".

LOG OF AUGER BOREHOLE NO. 3

SITE: Port Pirie Hospital Extension.
PLANT: R.60 Land Rover - mounted power auger.
DRILLER: C.R. McMahon. DRIVER: R.D. Jennings.
PURPOSE: Investigation of foundation conditions.
DATE COMMENCED: 5.12.1956. DATE COMPLETED: 5.12.1956
Logged by A.A. GIBSON.

<u>Depth</u>		<u>Description</u>
<u>From</u>	<u>To</u>	
0'0"	0'6"	Road material.
0'6"	1'6"	Light yellow-brown clayey sand.
1'6"	7'6"	Very soft and wet greenish clay with yellow-brown mottling. Silty.
7'6"	11'0"	Mid-grey, finely sandy clay. Very soft.
11'0"	11'3"	Stiff, yellow-brown, finely sandy clay.
11'3"	16'6"	Very soft to soft reddish brown and yellowish brown clays. Finely sandy.
16'6"	19'0"	Moderately firm, reddish-brown sandy clay.
19'0"	20'9"	Alternate firm and soft bands of yellowish-brown clay.
20'9"	21'3"	Very firm, brown, silty clay.
21'3"	21'9"	Very soft, brown, silty clay.
21'9"	24'9"	Very firm, brown, silty clay with occasional thin, soft bands.
24'9"	25'9"	Very soft, brown, silty clay.
25'9"	30'0"	Moderately firm, brown, silty clay.
30'0"	32'0"	Soft, brown, silty clay.
32'0"	33'6"	Firm, brown, silty clay with a few thin soft bands.
33'6"	35'0"	Very stiff, brown, silty clay merging to softer clay.
35'0"	37'0"	Moderately soft, brown, silty clay.
37'0"	37'9"	Moderately firm, brown, silty clay, becoming stiffer with depth.
37'9"	40'0"	Very stiff, red-brown and grey mottled clay with occasional softer bands.
40'0"	40'9"	Moderately soft red-brown clay.
40'9"	41'6"	Alternate firm and soft bands of red-brown and grey mottled clay.
41'6"	46'9"	Very stiff, red-brown and grey mottled clay with occasional thin softer bands.

14.23
End of Hole - Water stands at 2'3".

LOG OF AUGER BOREHOLE NO. 4

6531-1300

SITE: Port Pirie Hospital Extension
PLANT: R.60 Land Rover - mounted power auger.
DRILLER: C.R. McMahon. DRIVER: T.D. Jennings.
PURPOSE: Investigation of foundation conditions.
DATE COMMENCED: 5.12.1956. COMPLETED: 5.12.1956
Logged by A.A. Gibson.

<u>Depth</u>		<u>Description</u>
<u>From</u>	<u>To.</u>	
0	2'0"	Light red-brown clayey sand fill.
2'0"	9'0"	Greenish grey clay with yellow-brown mottling. Silty. Very moist and soft.
9'0"	17'0"	Mid-grey finely sandy clay/ Very soft.
17'0"	22'0"	Moderately firm yellowish-brown silty clay with some soft layers.
22'0"	23'6"	Very firm, brown, finely sandy clay.
23'6"	24' 0"	Pale grey shelly mud.
24'0"	24'6"	Firm, brown, finely sandy clay.
24'6"	27'0"	Soft, brown, finely sandy clay.
27'0"	28'0"	Moderately firm, brown, silty clay.
28'0"	30'0"	Very firm, brown, silty clay.
30'0"	32'0"	Moderately firm, brown, silty clay, merging to soft clay.
32'0"	33'6"	Soft, brown, finely sandy clay.
33'6"	34'0"	Firm to very firm brown, silty clay.
34'0"	37'0"	Alternate soft and firm bands of brown, silty clay, soft bands predominating.
37'0"	39'9"	Moderately firm, brown, silty clay, very stiff at 39'9".
39'9"	41'0"	Firm, red-brown clay with grey mottling. Very stiff at 41'0".
41'0"	41'9"	Moderately firm, red-brown clay with grey mottling.
41'9"	49'0"	Very stiff, red-brown and grey mottled clay, occa- sional thin soft bands.

End of hole - Water stands at 4ft.

14.94

LOG OF AUGER BOREHOLE NO. 5

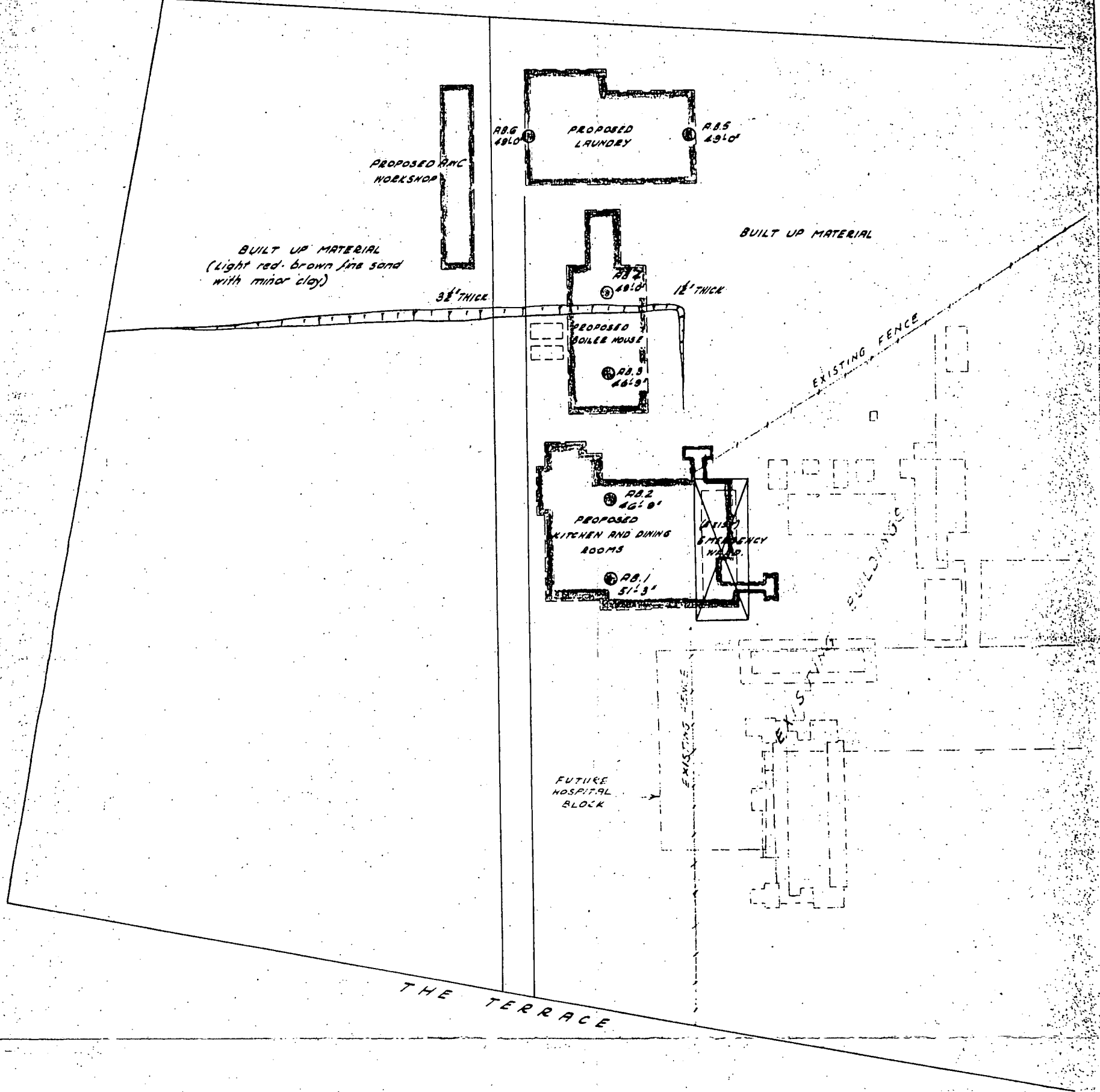
6531-1331

SITE: Port Pirie Hospital Extension.
 PLANT: R.60 Land Rover - mounted power auger.
 DRILLER: C.R. McMahon. DROVER: T.D. Jennings.
 PURPOSE: Investigation of foundation conditions.
 DATE COMMENCED: 6.12.1956. DATE COMPLETED: 6.12.1956

Logged by A.A. Gibson.

<u>Depth</u>		<u>Description</u>	
<u>FROM</u>	<u>To</u>		
0	0' 9"	Light red-brown clayey sand.	
0' 9"	1' 9"	Moderately firm, greenish-grey clay with yellow brown mottling. Sandy.	
1 9	10 0	Soft, greenish-grey sandy clay with yellow-brown mottling.	
10 0	12 6	Moderately firm, mid-grey, finely sandy clay.	
12 6	16 0	Very firm to very stiff, mid-grey, silty sand.	
16 0	17 0	Soft and wet, mid-grey, sandy clay.	
17 0	18 0	Moderately firm, yellowish-brown, finely sandy clay.	
18 0	21 6	Very firm, yellowish-brown, finely sandy clay with some thin softer bands.	
21 6	22 6	Very soft and sandy, light reddish-brown clay.	Much
22 6	23 0	Very stiff, brown, silty clay.	(Water.
23 0	27 0	Very soft, brown, silty clay.	
27 0	29 6	Moderately firm, brown, silty clay.	
29 6	32 6	Soft, brown, finely sandy clay.	
32 6	36 0	Stiff to very stiff, brown, silty clay with occasional thin, softer bands.	
36 0	37 0	Moderately firm, brown, silty clay.	
37 0	38 0	Very stiff brown clay with some thin softer bands.	
38 0	41 9	Silty.	
		Moderately firm, brown, sandy clay with some soft bands.	
41 9	49 0	Very stiff red-brown and grey mottled clay with occasional thin softer bands,	

14.94
 End of hole - Water stands at 2'9".



① POWER AUGER TEST BOREHOLES AB. 1 TO AB.6

To accompany report by A.A. Gibson Senior Geologist

S.A. DEPARTMENT OF MINES

FOUNDATION TESTING.

Approved	Passed	Scale: 50' 1"
		Dyn. - 56-320